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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/942,038 | 08/30/2001 | Yoshihiro Mori | 0819-0637 | 7302 |

22204 7590 10/22/2003
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EXAMINER

HUYNH, YENNHU B

| ART UNIT | PAPER NUMBER |
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2813

DATE MAILED: 10/22/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/942,038

Applicant(s)

MORI ET AL.

Examiner

Yennhu B Huynh

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 July 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 38-59 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 38-59 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 15.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

This Office Action is in response to the Amendment filed on 7/21/03.

Election/Restrictions

Claims 1-9 withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a non-elected claim, there being no allowable generic or linking claim.

Election was made without traverse in Paper No. 7.

Claim 10 has been canceled by Amendment filed on 10/29/02.

Claims 11-37 are cancelled by the Amendment filed on 7/21/03.

Under Rule 1.126, the newly added claims 38-59 have been renumbered to 1-22.

Drawings

The proposed drawing correction and/or the proposed substitute sheets of drawings, filed on 10/29/02 has been accepted.

Specification

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The title has been changed as follows: Method For Fabricating Semiconductor Device Including Annealing Lower Electrode In A Reducing Atmosphere Before Capacitor Insulating Film Forming.

Claim Objections

Claim 38 is objected to because of the following informalities:

In claim 38:

-line 3, the recited limitation --forming a lower electrode-- should be changed to --forming a lower electrode--.

-line 6, the recited limitation --on the lower electrode-- should be changed to --on the lower electrode--.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 38, 40, 43-50 & 52-59, are rejected under 35 U.S.C. 103(a) as being unpatentable over Satoru et al. (JP10261770A) in view of Watanabe et al. (U.S. 5,723,379). *new ref.*

Satoru et al. disclose a semiconductor device, which include:

-Re. claims 38, 40, 43-50 & 52-59: a lower capacitor electrode 8 made of a noble metal, or refractory metal, or Pt, Ru, Ir or RuO₂, IrO₂; annealing the lower electrode before forming the capacitor dielectric film 9 made of BST, SBT, Ta₂O₅ formed in oxidizing atmosphere and a upper capacitor electrode 10 formed on the dielectric layer;

and wherein the capacitive insulating film is crystallized by a heat treatment after annealing the lower electrode and before forming the upper electrode (Abstract, page 4, cols. 1, 2 & 6).

However, Satoru et al. do not disclose wherein the annealing lower electrode is in a reducing atmosphere that contains impurity atoms, and wherein the lower electrode has 100nm or less at the thinnest part.

Watanabe et al. disclose a method for fabricating a polycrystalline silicon surface, which includes the annealing lower electrode, contains impurity atoms (col.5, lines 13-38, col. 5 & 6 lines 53-10, and col. 6 lines 16-24), and wherein the annealing lower electrode is performed in argon atmosphere contains hydrogen (col.11, lines 30-54 and col.12 lines 29-38).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Satoru invention by incorporation the annealing lower electrode in a reducing atmosphere contains impurity atom, in order to increase the stiffness of the lower electrode by sufficient impurity taken into the lower electrode.

The lower electrode thickness is considered to involve routine optimization while has been held to be within the level of ordinary skill in the art, As noted In re Aller 105 USPQ233, 255 (CCPA 1955)., the selection of reaction parameters such as temperature and concentration would have been obvious.

"Normally, it is to expected that a change in temperature, or in range, concentration, cycles, thickness, would be an unpatentable modification. Under some circumstance, however, changes such as these may be impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art ... such ranges are termed "critical ranges and the applicant has the burden of proving such criticality ... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller 105 USPQ233, 255 (CCPA 1955). See also In re Waite 77 USPQ 586 (CCPA

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1948); In re Scherl 70 USPQ 204 (CCPA 1946); In re Irmischer 66 USPQ 314 (CCPA 1945); In re Norman 66 USPQ 308 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 51 is rejected under 35 U.S.C. 103(a) as being unpatentable Satoru et al. (JP10261770A) in view of Watanabe et al. (U.S. 5,723,379) and Andricacos et al. (U.S. 5,825,609)

Satoru et al. and Watanabe et al. disclose substantially all of claimed invention, except wherein the electrode made of Rh.

Andricacos et al. disclose a compound electrode stack capacitor, which include:

-Re claim 51: wherein the capacitor electrodes made of Rhodium (col.7, lines 1-11).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Satoru et al. and Watanabe et al invention by incorporation the Rhodium electrodes layer, to prevent the leakage current problem with the Rh superior electrical reliability characteristics.

Claim 39 is rejected under 35 U.S.C. 103(a) as being unpatentable over Satoru et al. (JP10261770A) in view of Watanabe et al. (U.S. 5,723,379) and Ichiro et al. (JP 11297945).

Satoru et al. and Watanabe et al. disclose substantially all of claimed invention, but do not disclose wherein the impurity atom is a hydrogen atom.

-Re. claim 39: Ichiro et al. disclose a ferroelectric memory manufacture, which include the impurity hydrogen atoms are induced into the lower electrode in the annealing process (Abstract and [0006]).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Satoru et al. and Watanabe et al invention by incorporation the impurity hydrogen atoms in annealing the lower electrode, to obtain a denser and reduce deformation of the lower electrode, because the bonding between the hydrogen atoms and metal atoms in the lower electrode at high temperature.

Claims 41 & 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Satoru et al. (JP10261770A) in view of Watanabe et al. (U.S. 5,723,379) and Saida et al. (U.S. 6,146,938).

Satoru et al. and Watanabe et al. disclose substantially all of claimed invention, but do not disclose forming an insulating film on the substrate and forming a recess on the insulating film (cl.41); and wherein the lower electrode is formed over (cl. 42)

-Re. claims 41 & 42: Saida et al. in related art disclose a method of fabricating semiconductor device having a lower electrode forming with impurity inducing into the substrate, which include an insulating film 11/13 on the substrate, then forming a recess 14 on the insulating film, and wherein the lower electrode 22 is formed in the recess (col.8 & 9, lines 62-44, fig.8).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Satoru et al. and Watanabe et al invention by incorporation the lower electrode forming in a recess that formed on an insulating film over the substrate, to decrease the thickness of insulating film as well as to increase the capacitor are in a memory cell construction.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

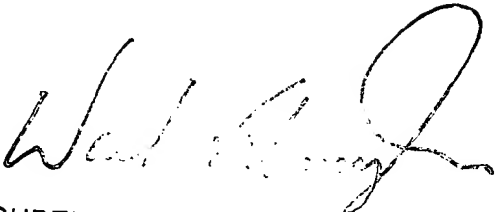
A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

YNBH,

10/17/03


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